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L1: Entry 2 of 2 File: DWPI Sep 11, 1998

DERWENT-ACC-NO: 1998-548784
DERWENT-WEEK: 199848

TITLE: Manufacturing method of multilayer printed circuit used in electronic device and electric equipment - involves forming circuit pattern and through hole on laminated sheet to form printed circuit which is then heated and pressed for full hardening and bonded on metal plate through insulated adhesive agent

PRIORITY-DATA: 1997JP-0039348 (February 24, 1997)

Search Selected Search ALL Clear

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
JP 10242637 A	September 11, 1998		005	H05K003/46

INT-CL (IPC): H05 K 3/46

ABSTRACTED-PUB-NO: JP 10242637A
BASIC-ABSTRACT:

The method begins by arranging and distributing a metallic foil for prepreg support between a pair of hot discs through a metal plate (2) to form a multilayer body. Heating pressure application is performed to the multilayer body to form a laminated sheet which is not fully hardened.

After forming a circuit pattern (4) and a through hole (6) on the laminated sheet, the laminated sheet goes through another heating pressure application for full hardening and to form a printed circuit (1). The printed circuit is bonded to the metal plate through an insulated adhesive agent (3).

ADVANTAGE - Extrudes void externally and moves insulated adhesive agent stably since pressure is uniformly applied to printed circuit and metal plate. Improves insulation reliability due to maintained uniform insulated adhesive agent layer and circuit pattern space. Maintains liquidity to eliminated void on printed circuit.

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L1: Entry 1 of 2 File: JPAB Sep 11, 1998

PUB-NO: JP410242637A
DOCUMENT-IDENTIFIER: JP 10242637 A
TITLE: MANUFACTURING METHOD OF MULTILAYER PRINTED WIRING BOARD AND MULTILAYERED PRINTED WIRING BOARD

PUBN-DATE: September 11, 1998

INVENTOR-INFORMATION:

NAME	COUNTRY
BABA, DAIZO	

INT-CL (IPC): H05 K 3/46

ABSTRACT:

PROBLEM TO BE SOLVED: To provide a manufacturing method, for a multilayered printed wiring board, in which the insulating distance between a metal plate and a printed wiring board is kept constant and in which the insulating property and the reliability of the multilayered printed wiring board can be enhanced.

SOLUTION: In a manufacturing method, an object to be laminated on which a metal foil to sandwich a prepreg is arranged between one pair of hot plates via metal plates, a first heating and pressurizing operation is performed, a laminated board in an unhardened state is formed, circuit patterns 4 and through holes 6 are formed on and in the laminated board, a second heating and pressurizing operation is performed, a printed wiring board 1 which is hardened is completely formed, and the printed wiring board 1 is pasted on a metal plate 2 by means of an adhesive 3.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the manufacture approach of a multilayer printed wiring board and multilayer printed wiring board with which the metal plate was especially stuck on the printed wired board about the manufacture approach of a multilayer printed wiring board, and a multilayer printed wiring board.
[0002]
[Description of the Prior Art] Various demands have also wanted the multilayer printed wiring board carrying electronic parts with diversification of electronic equipment in recent years and an electrical machinery and apparatus. For example, since the electronic parts which become an elevated temperature are carried, the multilayer printed wiring board which sticks a metal plate and is formed came to be used.
[0003] The above-mentioned multilayer printed wiring board is a multilayer printed wiring board which sticks a metal plate on the printed wired board in which the circuit pattern was formed, and is formed in it through insulating adhesives, and it conducts the heat generated from the electronic parts carried in the printed wired board side to a metal plate, and it is made to radiate heat from a metal plate.
[0004] However, in order not to apply a pressure to homogeneity in case a metal plate and a printed wired board are pressurized and stuck since it has irregularity at an insulating layer and a circuit pattern in the printed wired board which constitutes the above-mentioned multilayer printed wiring board, the distance of a metal plate and a printed wired board became an ununiformity, and dispersion arose in the transfer time of the heat generated from the electronic parts carried in the printed wired board, i.e., the thermal conductivity to a metal plate. Furthermore, the irregularity of the above-mentioned circuit pattern and an insulating layer became the obstruction of the insulating adhesives which move when pressurized similarly, in order that insulating adhesives might pile up in a part for the height of a circuit pattern, the thickness of an insulating layer did not become fixed, but insulation worsened, and the case where a void remained was in the part in which insulating adhesives piled up further.
[0005]
[Problem(s) to be Solved by the Invention] The place which this invention is made in view of the above-mentioned problem, and is made into the object keeps constant the distance for insulation of a metal plate and a printed wired board, and is to offer the manufacture approach of the multilayer printed wiring board which can aim at insulating improvement and improvement in dependability, and a multilayer printed wiring board.
[0006]
[Means for Solving the Problem] The manufacture approach of the multilayer printed wiring board concerning claim 1 of this invention Arrange the laminated object which has arranged the metallic foil so that prepreg may be pinched between the heating plates of a couple through a metal plate, perform 1st heating application of pressure, and the laminate in the condition of not hardening is formed. After forming a circuit pattern and SURUHORU in this laminate, the printed wired board which performed

and carried out full hardening of the 2nd heating application of pressure is formed, and it is characterized by sticking this printed wired board on a metal plate through insulating adhesives.
[0007] In the manufacture approach of the multilayer printed wiring board the claim 1 above-mentioned publication, after the manufacture approach of the multilayer printed wiring board concerning claim 2 of this invention fills up SURUHORU of a printed wired board with conductive paste, it is characterized by performing 2nd heating application of pressure.
[0008] The manufacture approach of the multilayer printed wiring board concerning claim 3 of this invention is characterized by using the insulating adhesives which the high temperature conductivity filler contained for the insulating adhesives which stick a printed wired board and a metal plate in the manufacture approach of above-mentioned claim 1 or a multilayer printed wiring board according to claim 2.
[0009] The multilayer printed wiring board concerning claim 4 of this invention is characterized by graduating the circuit pattern formed in this printed wired board in the multilayer printed wiring board which comes to stick a metal plate through insulating adhesives in the printed wired board in which the circuit pattern was formed on the same field as the insulating layer which constitutes a printed wired board.
[0010] The multilayer printed wiring board concerning claim 5 of this invention is a multilayer printed wiring board characterized by filling up SURUHORU of a printed wired board with conductive paste in the multilayer printed wiring board of the claim 4 above-mentioned publication.
[0011] The multilayer printed wiring board concerning claim 6 of this invention is characterized by the high temperature conductivity filler containing in the insulating adhesives which stick a printed wired board and a metal plate in above-mentioned claim 4 or a multilayer printed wiring board according to claim 5.
[0012] The multilayer printed wiring board concerning claim 7 of this invention is a multilayer printed wiring board characterized by the high temperature conductivity filler containing in the thermosetting resin which constitutes a printed wired board in above-mentioned claim 4 thru/or a multilayer printed wiring board according to claim 6.
[0013]
[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained concretely.
[0014] In this invention, what sank into base materials which consist of natural fibers, such as organic fiber, such as inorganic fibers, such as glass and asbestos, polyester, a polyamide, and polyphenylene sulfide, and cotton, such as textile fabrics and a nonwoven fabric, and dried thermosetting resin, such as an epoxy resin, polyimide resin, and polyphenylene oxide resin, as prepreg can be used. moreover, the foil of these alloys besides a foil made from copper, aluminum, brass, nickel, iron, etc. as a metallic foil and compound -- being **** -- etc. -- it can be used.
[0015] Moreover, especially as a high temperature conductivity filler which can use the above-mentioned thermosetting resin and is contained as insulating adhesives, although it does not limit, it is desirable for oxidation aluminum SHINIUMU (aluminum 2O3) powder, alumimium nitride (AlN) powder, oxidation silicon (SiO2) powder, silicon nitride (SiN) powder, boron nitride (BN) powder, etc. to have high temperature conductivity, and to use the inorganic high powder of electric insulation, for example. Aluminum oxide dust and alumimium nitride powder are desirable also especially in these, and when it is alumimium nitride powder, what raised moisture resistance is useful by oxidizing a front face and forming the oxidizing zone of an aluminum oxide. Moreover, in order to improve compatibility with resin with resin at a high temperature conductivity filler, it may be made to perform surface treatment, such as coupling processing. As for this high temperature conductivity filler, it is desirable to blend with the resin which constitutes the above-mentioned insulating adhesives with 60 - 90% of the weight of a content, and that content cannot expect effectiveness by blending a high temperature conductivity filler at less than 60 % of the weight. Moreover, it is if 90 % of the weight is exceeded. There is a possibility that the viscosity of the resin at the time of shaping may become high too much.
[0016] Moreover, as conductive paste, silver, copper, carbon, etc. can be made into a particle and what distributed thermosetting resin as a binder polymer can be used. Using the resin which the above-

mentioned prepreg was made to contain has the same properties, such as the temperature characteristic, and this thermosetting resin is desirable.

[0017] Next, the manufacture approach of a multilayer printed wiring board is explained. First, while piling up two or more above-mentioned prepregs, a metallic foil is piled up, a laminated object is formed, through a metal plate, it allots between the heating plates of a couple, and laminate molding of the 1st heating application of pressure is carried out and carried out. The process condition at this time fabricates a laminate so that the temperature to heat and the time amount to heat may be controlled and some thermosetting resin may be in a semi-hardening condition. As for this process condition, it is desirable to heat by the time amount of about 1 / 3 - 1/2 of the time amount of this shaping which it is decided by the class of thermosetting resin, the number of sheets of prepreg, etc. that will be arbitration, and is generally used.

[0018] Next, SURUHORU processing is performed for the obtained laminate, SURUHORU 6 is formed, further, etching processing of the metallic foil is carried out, the circuit pattern 4 is formed in a front face, and as shown in drawing 2 , a printed wired board 1 is formed. Here, the printed wired board which filled up said SURUHORU with conductive paste can also be formed. If SURUHORU is filled up in conductive paste, the flow dependability of SURUHORU can be improved.

[0019] Furthermore, as 2nd heating application of pressure is performed, full hardening of thermosetting resin is attained and it is shown in drawing 3 , the circuit pattern 4 and the front face of an insulating layer 5 are uniform, and can form the printed wired board 1 with a smooth front face. Since this 2nd heating application of pressure has resin in a semi-hardening condition by the 1st above-mentioned heating application of pressure, the circuit pattern 4 lays it under the insulating layer 5.

[0020] And as shown in drawing 1 , the insulating adhesives 3 can be applied to the above-mentioned printed wired board 1 or a metal plate 2, laminating adhesion can be carried out, and a multilayer printed wiring board can be manufactured. When [this] carrying out laminating adhesion, since the front face of a printed wired board 1 and a metal plate 2 is smooth, it is easy to apply the insulating adhesives 3 to homogeneity, and it can apply a pressure to homogeneity further.

[0021]

[Example] Hereafter, an example explains this invention concretely.

[0022] (Example 1) It carries out epoxy resin sinking in, stoving was carried out to glass fabrics, and the prepreg (the Matsushita Electric Works, Ltd. make, trade name R1661) of B stage condition with a thickness of 0.15mm was formed. Two sheets of this prepreg were piled up, and further, copper foil with a thickness of 35 micrometers was laid on top of these both sides, the laminated object was formed, and heating pressing was performed through the metal plate, and it fabricated so that the amount of non-hard spot might remain in an epoxy resin. A process condition is a process condition for 20 minutes at 170 degrees C further for 10 minutes in 130 degrees C whenever [pressure / of 25kg/cm2 /, and stoving temperature].

[0023] SURUHORU processing and etching ****** were given to the laminate obtained by the above-mentioned shaping, SURUHORU and a circuit pattern were formed, and the printed wired board was formed. And heating pressing of this printed wired board was carried out again, the circuit pattern was laid under the non-hardening resin layer, and the printed wired board by which the front face was graduated was formed. A process condition is a process condition for 60 minutes at 170 degrees C further for 20 minutes in 130 degrees C whenever [pressure / of 30kg/cm2 /, and stoving temperature].

[0024] And in order to stick the printed wired board by which the above-mentioned front face was graduated on the copper plate which is a metal plate, laminate molding of the epoxy resin adhesive was applied and carried out to the copper plate by the thickness of 120 micrometers. Furthermore, coating of the resist was carried out to homogeneity on the surface of the printed wired board, it dried and the multilayer printed wiring board was obtained.

[0025] (Example 2) The printed wired board by which 1st and 2nd heating pressing was performed, and the front face was graduated like the example 1 was obtained.

[0026] And in order to stick the printed wired board and copper plate by which the above-mentioned front face was graduated, the high temperature conductivity filler applied and carried out laminate

molding of the epoxy resin adhesive contained 80% of the weight to the metal plate by the thickness of 120 micrometers. Furthermore, coating of the resist was carried out to homogeneity on the surface of the printed wired board, it dried and the multilayer printed wiring board was obtained.
[0027] (Example 3) A high temperature conductivity filler uses the epoxy resin contained 80% of the weight for glass fabrics, and also this epoxy resin is sunk into glass fabrics like an example 1, stoving was carried out, and the prepreg of B stage condition with a thickness of 0.15mm was formed. Two sheets of this prepreg were piled up, and further, copper foil with a thickness of 35 micrometers was laid on top of these both sides, the laminated object was formed, and heating pressing was performed through the metal plate, and it fabricated so that the amount of non-hard spot might remain in an epoxy resin. And SURUHORU processing and etching ****** were given to the obtained laminate, SURUHORU and a circuit pattern were formed, and the printed wired board was formed. And heating pressing of this printed wired board was carried out again, the circuit pattern was laid under the non-hardening resin layer, and the printed wired board by which the front face was graduated was formed. And in order to stick the printed wired board by which the above-mentioned front face was graduated on the copper plate which is a metal plate, laminate molding of the epoxy resin adhesive was applied and carried out to the copper plate by the thickness of 120 micrometers. Furthermore, coating of the resist was carried out to homogeneity on the surface of the printed wired board, it dried and the multilayer printed wiring board was obtained.
[0028] (Example 1 of a comparison) It carries out epoxy resin sinking in, stoving was carried out to glass fabrics, and the prepreg (the Matsushita Electric Works, Ltd. make, trade name R1661) of B stage condition with a thickness of 0.15mm was formed. Two sheets of this prepreg were piled up, and further, copper foil with a thickness of 35 micrometers was laid on top of these both sides, the laminated object was formed, and heating pressing was performed through the metal plate, and it fabricated so that an epoxy resin might carry out full hardening. The process condition for 70 minutes performed the process condition at 170 degrees C further for 25 minutes by 130 degrees C whenever [pressure / of 30kg/cm2 /, and stoving temperature].
[0029] SURUHORU processing and etching ****** were given to the laminate obtained by the above-mentioned shaping, SURUHORU and a circuit pattern were formed, and the printed wired board was formed. And epoxy resin adhesive carried out laminate molding of this printed wired board to the copper plate to which it was applied by the thickness of 120 micrometers. Furthermore, coating of the resist was carried out to homogeneity on the surface of the printed wired board, it dried and the multilayer printed wiring board was obtained.
[0030] The result of having evaluated the multilayer printed wiring board formed above was indicated to a table 1.
[0031]
[A table 1] The residual of a void: There is no void which remained in the insulating adhesives which stuck the printed wired board and the metal plate, or the cross section was checked by viewing.
[0032] Thermal conductivity: It heated from the front face of a multilayer printed wiring board, and computed from the temperature rise of a metal plate.
[0033] The void in a resist: The void which remained in the resist applied on the surface of the multilayer printed wiring board was checked by viewing.
[0034] Breakdown voltage: The electrical potential difference was impressed between the multilayer printed wiring board and the metal plate, and the electrical potential difference which destroyed and energized the insulating glue line was measured.
[0035] As shown in a table 1, in order that there may be no irregularity of the circuit pattern of the printed wired board to constitute, a void does not remain, but the insulating dependability of the multilayer printed wiring board of this invention is high. Moreover, the heat which generated heat by the circuit pattern can be easily transmitted to a metal plate by making thermosetting resin and insulating adhesives contain a high temperature conductivity filler.
[0036]
[Effect of the Invention] As mentioned above, according to the manufacture approach of the multilayer

printed wiring board of this invention Arrange the laminated object which has arranged the metallic foil so that prepreg may be pinched between the heating plates of a couple through a metal plate, perform 1st heating application of pressure, and the laminate in the condition of not hardening is formed. Since the printed wired board which performed and carried out full hardening of the 2nd heating application of pressure is formed and this printed wired board is stuck on a metal plate through insulating adhesives after forming a circuit pattern and SURUHORU in this laminate Since a multilayer printed wiring board can be formed in the smooth condition, without the irregularity of the circuit pattern formed in the printed wired board coming out to a front face In case laminate molding is carried out, a pressure can be applied to a printed wired board and a metal plate at homogeneity, it can carry out by the ability stabilizing migration of insulating adhesives, and a void can be extruded outside. Moreover, since the front face of a printed wired board is graduated, spacing of the circuit pattern of a printed wired board and a metal plate can become homogeneity, an insulating adhesives layer can be maintained at homogeneity, and insulating dependability can be improved.

[0037] Furthermore, since the front face of a printed wired board is graduated even if it contains a high temperature conductivity filler in the thermosetting resin which constitutes a printed wired board, and insulating adhesives, a fluidity is maintained and there is also no residual of a void.

[Translation done.]

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CLAIMS

[Claim(s)]
[Claim 1] the manufacture approach of the multilayer printed wiring board characterize by to form the printed wired board which performed and carried out full hardening of the 2nd heating application of pressure after having arranged the laminated object which have arrange the metallic foil between the heating plates of a couple through the metal plate , having performed the 1st heating application of pressure , having formed the laminate in the condition do not harden and forming a circuit pattern and SURUHORU in this laminate so that prepreg may pinch , and to stick this printed wired board on a metal plate through insulating adhesives
[Claim 2] The manufacture approach of the multilayer printed wiring board characterized by performing 2nd heating application of pressure in the manufacture approach of the multilayer printed wiring board the claim 1 above-mentioned publication after filling up SURUHORU of a printed wired board with conductive paste.
[Claim 3] The manufacture approach of the multilayer printed wiring board characterized by using the insulating adhesives which the high temperature conductivity filler contained in the insulating adhesives which stick a printed wired board and a metal plate in the manufacture approach of above-mentioned claim 1 or a multilayer printed wiring board according to claim 2.
[Claim 4] The multilayer printed wiring board characterized by graduating the circuit pattern formed in this printed wired board in the multilayer printed wiring board which comes to stick a metal plate through insulating adhesives in the printed wired board in which the circuit pattern was formed on the same field as the insulating layer which constitutes a printed wired board.
[Claim 5] The multilayer printed wiring board characterized by filling up SURUHORU of a printed wired board with conductive paste in the multilayer printed wiring board of the claim 4 above-mentioned publication.
[Claim 6] The multilayer printed wiring board characterized by the high temperature conductivity filler containing in the insulating adhesives which stick a printed wired board and a metal plate in above-mentioned claim 4 or a multilayer printed wiring board according to claim 5.
[Claim 7] The multilayer printed wiring board characterized by the high temperature conductivity filler containing in the thermosetting resin which constitutes a printed wired board in above-mentioned claim 4 thru/or a multilayer printed wiring board according to claim 6.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the sectional view of the multilayer printed wiring board of 1 operation gestalt of this invention.
[Drawing 2] It is a sectional view explaining the manufacture approach of the multilayer printed wiring board of 1 operation gestalt of this invention.
[Drawing 3] It is a sectional view explaining the manufacture approach of the multilayer printed wiring board of 1 operation gestalt of this invention.
[Description of Notations]
1 Printed Wired Board
2 Metal Plate
3 Insulating Adhesives
4 Circuit Pattern
5 Insulating Layer
6 SURUHORU

[Translation done.]

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(43)公開日　平成10年(1998)９月11日

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審査請求　未請求　請求項の数７　ＯＬ　（全 5 頁）

(21)出願番号　特願平9－39348
(22)出願日　平成９年(1997)２月24日

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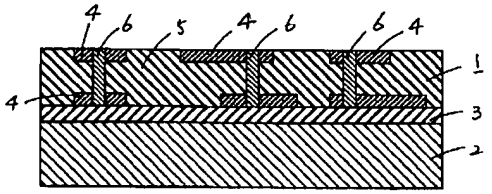
(54)【発明の名称】　多層プリント配線板の製造方法及び多層プリント配線板

(57)【要約】
【課題】　金属板とプリント配線板の絶縁距離を一定に保ち、絶縁性の向上と信頼性の向上を図ることができる多層プリント配線板の製造方法と多層プリント配線板を提供することにある。
【解決手段】　本発明の多層プリント配線板の製造方法は、プリプレグを挟持するように金属箔を配置した被積層体を、金属プレートを介して一対の熱盤間に配して第１の加熱加圧を行って未硬化状態の積層板を形成し、該積層板に回路パターンとスルホールを形成した後、第２の加熱加圧を行い完全硬化したプリント配線板を形成し、該プリント配線板を絶縁接着剤を介して金属板に貼着することを特徴とする。



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【特許請求の範囲】

【請求項1】　プリプレグを挟持するように金属箔を配置した被積層体を、金属プレートを介して一対の熱盤間に配して第1の加熱加圧を行って未硬化状態の積層板を形成し、該積層板に回路パターンとスルホールを形成した後、第2の加熱加圧を行い完全硬化したプリント配線板を形成し、該プリント配線板を絶縁接着剤を介して金属板に貼着することを特徴とする多層プリント配線板の製造方法。

【請求項2】　上記請求項1記載の多層プリント配線板の製造方法において、プリント配線板のスルホールに導電ペーストを充填した後、第2の加熱加圧を行なうことを特徴とする多層プリント配線板の製造方法。

【請求項3】　上記請求項1又は請求項2記載の多層プリント配線板の製造方法において、プリント配線板と金属板を貼着する絶縁接着剤に、高熱伝導性フィラーが含有した絶縁接着剤を使用することを特徴とする多層プリント配線板の製造方法。

【請求項4】　回路パターンが形成されたプリント配線板を絶縁接着剤を介して金属板を貼着してなる多層プリント配線板において、該プリント配線板に形成された回路パターンが、プリント配線板を構成する絶縁層と同一面上で平滑化されていることを特徴とする多層プリント配線板。

【請求項5】　上記請求項4記載の多層プリント配線板において、プリント配線板のスルホールに導電ペーストが充填されていることを特徴とする多層プリント配線板。

【請求項6】　上記請求項4又は請求項5記載の多層プリント配線板において、プリント配線板と金属板を貼着する絶縁接着剤に高熱伝導性フィラーが含有されていることを特徴とする多層プリント配線板。

【請求項7】　上記請求項4乃至請求項6記載の多層プリント配線板において、プリント配線板を構成する熱硬化性樹脂に高熱伝導性フィラーが含有されていることを特徴とする多層プリント配線板。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、多層プリント配線板の製造方法及び多層プリント配線板に関するもので、特に、金属板がプリント配線板に貼着された多層プリント配線板の製造方法及び多層プリント配線板に関するものである。

【0002】

【従来の技術】近年の電子機器、電気機器の多様化に伴って、電子部品を搭載する多層プリント配線板も様々な要求が欲せられてきた。例えば、高温になる電子部品を搭載するために金属板を貼着して形成される多層プリント配線板が使用されるようになった。

【0003】上記多層プリント配線板は、回路パターンが形成されたプリント配線板に絶縁接着剤を介して金属板を貼着して形成される多層プリント配線板で、プリント配線板側に搭載された電子部品より発生する熱を金属板に伝導し、金属板より放熱するようにしたものである。

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【0004】しかしながら、上記多層プリント配線板を構成するプリント配線板には絶縁層と回路パターンとに凹凸を有するので、金属板とプリント配線板とを加圧して貼着する際、均一に圧力がかからないために、金属板とプリント配線板との距離が不均一になり、プリント配線板に搭載した電子部品から発生する熱の伝達時間、つまり、金属板への熱伝導性にばらつきが生じた。さらに、同様に上記回路パターンと絶縁層との凹凸が、加圧された時に移動する絶縁接着剤の障壁となり、絶縁接着剤が回路パターンの凸状部分に滞留するため絶縁層の厚みが一定にならず、絶縁性が悪くなり、さらに、絶縁接着剤が滞留した部分にボイドが残存する場合があった。

【0005】

【発明が解決しようとする課題】本発明は上記の問題に鑑みてなされたものであり、その目的とするところは、金属板とプリント配線板の絶縁距離を一定に保ち、絶縁性の向上と信頼性の向上を図ることができる多層プリント配線板の製造方法と多層プリント配線板を提供することにある。

【0006】

【課題を解決するための手段】本発明の請求項1に係る多層プリント配線板の製造方法は、プリプレグを挟持するように金属箔を配置した被積層体を、金属プレートを介して一対の熱盤間に配して第1の加熱加圧を行って未硬化状態の積層板を形成し、該積層板に回路パターンとスルホールを形成した後、第2の加熱加圧を行い完全硬化したプリント配線板を形成し、該プリント配線板を絶縁接着剤を介して金属板に貼着することを特徴とする。

【0007】本発明の請求項2に係る多層プリント配線板の製造方法は、上記請求項1記載の多層プリント配線板の製造方法において、プリント配線板のスルホールに導電ペーストを充填した後、第2の加熱加圧を行なうことを特徴とする。

【0008】本発明の請求項3に係る多層プリント配線板の製造方法は、上記請求項1又は請求項2記載の多層プリント配線板の製造方法において、プリント配線板と金属板を貼着する絶縁接着剤に、高熱伝導性フィラーが含有した絶縁接着剤を使用することを特徴とする。

【0009】本発明の請求項4に係る多層プリント配線板は、回路パターンが形成されたプリント配線板を絶縁接着剤を介して金属板を貼着してなる多層プリント配線板において、該プリント配線板に形成された回路パターンが、プリント配線板を構成する絶縁層と同一面上で平滑化されていることを特徴とする。

【0010】本発明の請求項5に係る多層プリント配線

板は、上記請求項４記載の多層プリント配線板において、プリント配線板のスルホールに導電ペーストが充填されていることを特徴とする多層プリント配線板。

【００１１】本発明の請求項６に係る多層プリント配線板は、上記請求項４又は請求項５記載の多層プリント配線板において、プリント配線板と金属板を貼着する絶縁接着剤に高熱伝導性フィラーが含有されていることを特徴とする。

【００１２】本発明の請求項７に係る多層プリント配線板は、上記請求項４乃至請求項６記載の多層プリント配線板において、プリント配線板を構成する熱硬化性樹脂に高熱伝導性フィラーが含有されていることを特徴とする多層プリント配線板。

【００１３】

【発明の実施の形態】以下、本発明の実施形態について具体的に説明する。

【００１４】本発明において、プリプレグとしては、エポキシ樹脂、ポリイミド樹脂、ポリフェニレンオキサイド樹脂等の熱硬化性樹脂を、ガラス、アスベスト等の無機質繊維、ポリエステル、ポリアミド、ポリフェニレンサルファイド等の有機繊維、木綿等の天然繊維からなる織布、不織布等の基材に含浸し、乾燥したものを用いることができる。また、金属箔としては、銅、アルミニウム、真鍮、ニッケル、鉄等を材料とする箔のほか、これらの合金の箔、複合箔なと等を使用することができる。

【００１５】また、絶縁接着剤としては、上記熱硬化性樹脂を使用することができ、含有する高熱伝導性フィラーとしては、特に限定するものではないが、例えば酸化アルミシニウム（Al_2O_3）粉末や、窒化アルミニウム（ＡｌＮ）粉末、酸化珪素（SiO_2）粉末、窒化珪素（ＳｉＮ）粉末、窒化硼素（ＢＮ）粉末など、高熱伝導率を有し、電気絶縁性の高い無機粉末を用いるのが好ましい。これらの中でも特に、酸化アルミニウム粉末や窒化アルミニウム粉末が好ましく、窒化アルミニウム粉末の場合には表面を酸化処理して酸化アルミニウムの酸化層を形成することによって、耐湿性を向上させたものが有用である。また、高熱伝導性フィラーには樹脂との樹脂との相溶性を良くするために、カップリング処理等の表面処理を行なうようにしてもよい。この高熱伝導性フィラーは、上記絶縁接着剤を構成する樹脂に６０～９０重量％の含有量で配合するのが好ましく、その含有量が６０重量％未満では、高熱伝導性フィラーを配合することによる効果を期待することができない。また、９０重量％を越えると。成形時の樹脂の粘度が過度に高くなるおそれがある。

【００１６】また、導電ペーストとしては、銀、銅、カーボン等を微粒子にし、熱硬化性樹脂をバインダーポリマーとして分散させたものを使用することができる。この熱硬化性樹脂は、上記プリプレグに含有させた樹脂を用いるのが温度特性などの特性が同一で好ましい。

【００１７】次に、多層プリント配線板の製造方法について説明する。まず、上記プリプレグを複数枚重ねると共に金属箔を重ね被積層体を形成し、金属プレートを介し、一対の熱盤間に配して第１の加熱加圧をして積層成形する。この時の成形条件は、加熱する温度、加熱する時間を制御して熱硬化性樹脂の一部が半硬化状態になるように積層板を成形する。この成形条件は、熱硬化性樹脂の種類、プリプレグの枚数等によって任意に決まるもので、一般に使用されている、本成形の時間の約１／３～１／２の時間で加熱するのが好ましい。

【００１８】次に、得られた積層板をスルホール加工を施しスルホール６を形成し、さらに、金属箔をエッチング加工して回路パターン４を表面に設け、図２に示す如く、プリント配線板１を形成する。ここで、前記スルホールに導電ペーストを充填したプリント配線板を形成することもできる。スルホールに導電ペーストを充填をすると、スルホールの導通信頼性を向上することができる。

【００１９】さらに、第２の加熱加圧を行なって熱硬化性樹脂の完全硬化を図り、図３に示す如く、回路パターン４と絶縁層５の表面とが均一で、表面の平滑なプリント配線板１を形成することができる。この第２の加熱加圧は、上記の第１の加熱加圧で樹脂が半硬化状態にあるので、回路パターン４が絶縁層５に埋設するのである。

【００２０】そして、図１に示す如く、上記プリント配線板１又は金属板２に絶縁接着剤３を塗布して積層接着して多層プリント配線板を製造することができる。この積層接着する場合、プリント配線板１と金属板２の表面が平滑であるため、絶縁接着剤３を均一に塗布することが容易で、さらに、均一に圧力を加えることができる。

【００２１】

【実施例】以下、本発明を実施例によって具体的に説明する。

【００２２】（実施例１）ガラスクロスにエポキシ樹脂含浸し、加熱乾燥させて、厚さ０．１５ｍｍのＢステージ状態のプリプレグ（松下電工株式会社製、商品名Ｒ１６６１）を形成した。このプリプレグを２枚重ね合わせ、さらに、この両面に厚さ３５μｍの銅箔を重ね合わせて被積層体を形成し、金属プレートを介して加熱加圧成形を行ない、エポキシ樹脂に未硬化部分が残るように成形した。成形条件は、圧力２５kg/cm²、加熱温度１３０℃で１０分間、さらに、１７０℃で２０分間の成形条件である。

【００２３】上記成形により得られた積層板にスルホール加工及びエッチング加工にを施してスルホールと回路パターンを形成しプリント配線板を形成した。そして、このプリント配線板を再度加熱加圧成形し、回路パターンを未硬化樹脂層に埋設し、表面が平滑化されたプリント配線板を形成した。成形条件は、圧力３０kg/cm²、加熱温度１３０℃で２０分間、さらに、１７０℃で６０分

間の成形条件である。

【００２４】そして、上記の表面が平滑化されたプリント配線板を金属板である銅板に貼着するために、エポキシ樹脂接着剤を銅板に１２０μｍの厚さで塗布して積層成形した。さらに、プリント配線板の表面にレジストを均一に塗工し、乾燥して多層プリント配線板を得た。

【００２５】（実施例２）実施例１と同様にして、第１及び第２の加熱加圧成形を行なって表面が平滑化されたプリント配線板を得た。

【００２６】そして、上記の表面が平滑化されたプリント配線板と銅板を貼着するために、高熱伝導性フィラーが８０重量％含有したエポキシ樹脂接着剤を金属板に１２０μｍの厚さで塗布し、積層成形した。さらに、プリント配線板の表面にレジストを均一に塗工し、乾燥して多層プリント配線板を得た。

【００２７】（実施例３）ガラスクロスに高熱伝導性フィラーが８０重量％含有したエポキシ樹脂を使用する他は、実施例１と同様にして、該エポキシ樹脂をガラスクロスに含浸し、加熱乾燥させて、厚さ０．１５ｍｍのＢステージ状態のプリプレグを形成した。このプリプレグを２枚重ね合わせ、さらに、この両面に厚さ３５μｍの銅箔を重ね合わせて被積層体を形成し、金属プレートを介して加熱加圧成形を行ない、エポキシ樹脂に未硬化部分が残るように成形した。そして、得られた積層板にスルホール加工及びエッチング加工にを施してスルホールと回路パターンを形成しプリント配線板を形成した。そして、このプリント配線板を再度加熱加圧成形し、回路パターンを未硬化樹脂層に埋設し、表面が平滑化されたプリント配線板を形成した。そして、上記の表面が平滑化されたプリント配線板を金属板である銅板に貼着するために、エポキシ樹脂接着剤を銅板に１２０μｍの厚さで塗布して積層成形した。さらに、プリント配線板の表面にレジストを均一に塗工し、乾燥して多層プリント配線板を得た。

【００２８】（比較例１）ガラスクロスにエポキシ樹脂含浸し、加熱乾燥させて、厚さ０．１５ｍｍのＢステージ状態のプリプレグ（松下電工株式会社製、商品名Ｒ１６６１）を形成した。このプリプレグを２枚重ね合わせ、さらに、この両面に厚さ３５μｍの銅箔を重ね合わせて被積層体を形成し、金属プレートを介して加熱加圧成形を行ない、エポキシ樹脂が完全硬化するように成形した。成形条件は、圧力３０kg/cm²、加熱温度１３０℃で２５分間、さらに、１７０℃で７０分間の成形条件で行なった。

【００２９】上記成形により得られた積層板にスルホール加工及びエッチング加工にを施してスルホールと回路パターンを形成しプリント配線板を形成した。そして、このプリント配線板を、エポキシ樹脂接着剤が１２０μｍの厚さで塗布された銅板に積層成形した。さらに、プリント配線板の表面にレジストを均一に塗工し、乾燥して多層プリント配線板を得た。

【００３０】上記で形成された多層プリント配線板を、評価した結果を表１に記載した。

【００３１】

【表１】ボイドの残留：プリント配線板と金属板とを貼着した絶縁接着剤に残留したボイドがないかその断面を目視により確認した。

【００３２】熱伝導率：多層プリント配線板の表面より加熱し、金属板の温度上昇より算出した。

【００３３】レジスト内ボイド：多層プリント配線板の表面に塗布したレジストの中に残留したボイドを目視により確認した。

【００３４】放電開始電圧：多層プリント配線板と金属板間に電圧を印加し、絶縁接着層を破壊して通電した電圧を測定した。

【００３５】表１に示すように、本発明の多層プリント配線板は、構成するプリント配線板の回路パターンの凹凸が無いためボイドが残留せず、絶縁信頼性も高い。また、熱硬化性樹脂、絶縁接着剤に高熱伝導性フィラーを含有させることにより、回路パターンで発熱した熱を金属板に容易に伝達することができる。

【００３６】

【発明の効果】上述したように、本発明の多層プリント配線板の製造方法によると、プリプレグを挟持するように金属箔を配置した被積層体を、金属プレートを介して一対の熱盤間に配して第１の加熱加圧を行って未硬化状態の積層板を形成し、該積層板に回路パターンとスルホールを形成した後、第２の加熱加圧を行い完全硬化したプリント配線板を形成し、該プリント配線板を絶縁接着剤を介して金属板に貼着するので、プリント配線板に形成された回路パターンの凹凸が表面にでることなく、平滑な状態で多層プリント配線板を形成することができるので、積層成形する際に、プリント配線板及び金属板に均一に圧力を加えることができ、絶縁接着剤の移動が安定して行なうことができ、ボイドを外部に押し出すことができる。また、プリント配線板の表面が平滑化されているため、プリント配線板の回路パターンと金属板との間隔が均一になり、絶縁接着剤層を均一に保つことができ、絶縁信頼性を向上することができる。

【００３７】さらに、プリント配線板を構成する熱硬化性樹脂、及び、絶縁接着剤に高熱伝導性フィラーを含有しても、プリント配線板の表面が平滑化されているため、流動性が維持されボイドの残留もない。

【図面の簡単な説明】

【図１】本発明の一実施形態の多層プリント配線板の断面図である。

【図２】本発明の一実施形態の多層プリント配線板の製造方法を説明する断面図である。

【図３】本発明の一実施形態の多層プリント配線板の製造方法を説明する断面図である。

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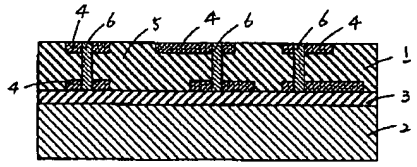
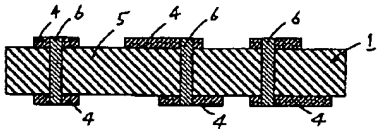
【符号の説明】

1　プリント配線板
2　金属板
3　絶縁接着剤
4　回路パターン
5　絶縁層
6　スルホール

【図１】



【図２】



【図３】